The determinants and outcomes of regional growth – Inter-regional evidence from China

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Background

- The "jobs-people-jobs" enigma (Muth, 1971; Mulligan et al., 1999).

- Regional adjustment model – analytical tool to justify the jobs-people relationship (Carruthers, 2019)

- Evidence from Western Countries over the past several decades (Boarnet, 1994; Carlino and Mills, 1987; Carruthers and Mulligan, 2008):

Population   ⇄   Employment

Urban and natural amenities
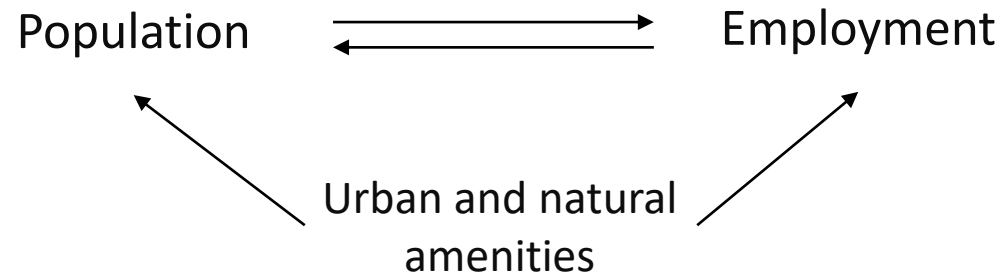
- Does such a model and conclusion also depict the migration pattern of China; and to what extent do Chinese people follow jobs and jobs follow people?

- **Gap 1: A lack of consideration on endogeneity**
  - Chinese-based studies have focused on effects of labor supply on employment growth or the other way around.
  - Few studies consider the endogeneity existing between people and jobs.

- **Gap 2: treating employment and population as homogenous is problematic**
  - **Issues with using total employment:**
    - Extensive economic restructuring occurred in Chinese regions over the past 20 years
    - Growth of non-basic sectors drive growth in basic sectors (Economic growth theory)
  - **Issues with using total population:**
    - Fail to consider the effects of the Hukou policy (a housing registration system) in regional growth.
    - Migration studies are delinked with social inequities and economic efficiencies

- **Research framework:**
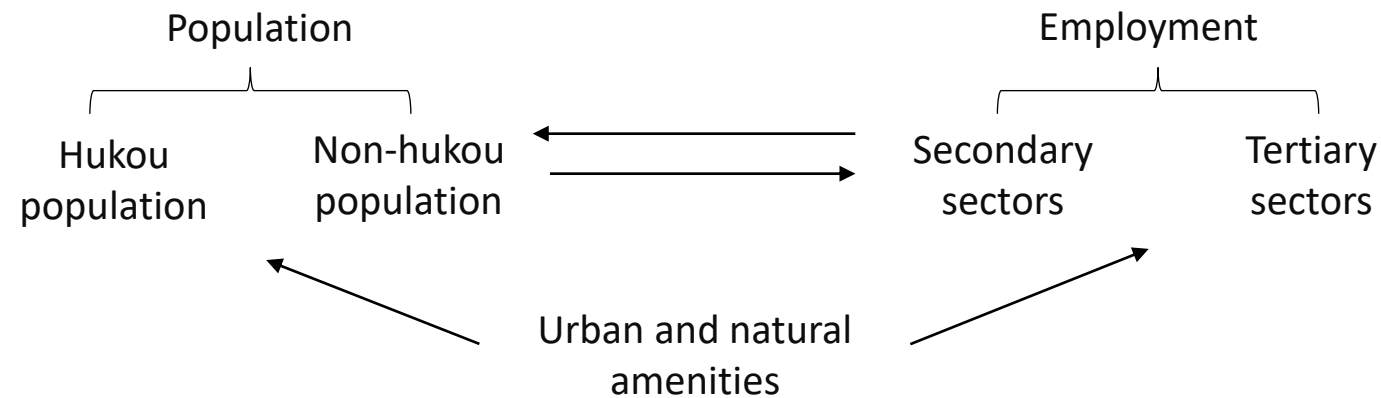
Debates of simultaneity between population and employment

Traditional wisdom: a unidirectional causality (Blanco, 1963; Borts and Stein, 1964)
- Demand-induced growth (based on export-based theory) versus Supply-induced growth

"Counter-urbanization" in 1970s (Frey, 1993)
- Regional restructuring explanation:
  - growth of advanced service and knowledge-based industries drove population from Rustbelt to Sunbelt regions
- De-concentration explanation:
  - the jobs-people relationship as a simultaneously determinant process
  - Personal preference toward amenities & Reduced transportation costs for both firms and people

Increasing influence of quality-of-life factors on individual migration decisions (Glaeser, 2001; 2003)
- regional growth manifests increased reliance on human capital
  - agglomeration of skilled workers and talents → industrial upgrading
- human capital is increasingly determined by local amenities
  - pleasant climate, convenient access to public services, intangible benefits (e.g., social diversity and tolerance) (Moeller, 2014).
- amenities are gaining increasing prominence in regional development, mainly due to their increasing appeal to human capital

China-based evidence

- **People follow jobs:**
  - In the early 1980s through 2000s, Foreign direct investment (FDI) and globalization of the manufacturing supply chain induced first-round growth in secondary industries.
  - The eastern coastal areas has taken the lead for development
    - policy support, cheap labor and land, and natural and geographical advantages (Tuan and Ng, 2003).
  - Labor forces (non-Hukou population) from the hinterlands migrated to the coastal regions for economic benefits (Fan, 2005).

- **Jobs follow people:**
  - skilled workers and amenity levels → advanced sectors and industrial upgrading (Florida et al., 2012; Qian, 2010)
  - the basic sectors have stimulated the first-round growth in non-basic sectors via multiplier effects (Xiao et al., 2012).
    - evidence: No. of regions with GDP in secondary industry > GDP in tertiary industry: 193 (2000), 128 (2010), 58 (2020).
  - a self-reinforcing process of economic agglomeration based on core-periphery model of New Economic Geography (NEG) (Fan, 2005; He and Mao, 2016)

Empirical Strategy

Regional adjustment model
- Population and employment represent the supply- and demand-side force of regional growth, respectively, and are endogenously determined toward a regional equilibrium condition.
- We use TSLS estimator to resolve the endogeneity issue between population and employment.

Supply-side equation:

First Stage: $\widehat{lnE_{i,t}} = v_1 lnE_{i,t-} + v_2 x_{i,t-}$

Second Stage: $ln(\frac{P_{i,t}}{P_{i,t-}}) = \alpha_0 + \alpha_1 \widehat{lnE_{i,t}} + \alpha_2 lnP_{i,t-} + \alpha_3 \boldsymbol{x}_{i,t-} + \epsilon_{i,p}$

Demand-side equation:

First Stage: $lnP_{i,t} = u_1 lnP_{i,t-} + u_2 x_{i,t-}$

Second Stage: $ln(\frac{E_{i,t}}{E_{i,t-}}) = \beta_0 + \beta_1 \widehat{lnP_{i,t}} + \beta_2 lnE_{i,t-} + \beta_3 \boldsymbol{z}_{i,t-} + \epsilon_{i,e}$

- t- and t represent two successive points in time.
   - Two time periods: 2002-2010 (t=2010, t-=2002) and 2010-2019 (t=2019, t-=2010).
- $\frac{P_{i,t}}{P_{i,t-}}$ and $\frac{E_{i,t}}{E_{i,t-}}$: the rate at which population (employment) at $t-$ adjust to population(employment) at time t for region i
- $E_{i,t}$ and $P_{i,t}$: employment and population at time t for region i
- $\boldsymbol{x}_{i,t-}$ and $\boldsymbol{z}_{i,t-}$: the control variables for the growth of population and employment.

Testing the varying effects of employment subgroups on population distribution:

$$ln(\frac{P_{i,t}}{P_{i,t-}}) = \gamma_0 + \gamma_1 \overbrace{lnSE_{i,t} \quad lnTE_{i,t}}^{lnE_{i,t}} + \gamma_2 lnP_{i,t-} + \boldsymbol{\gamma_3 x_{i,t-}} + \epsilon_{i,p}$$

- SE: employment in the secondary sectors; TE: employment in the tertiary sectors

Testing the varying effects of population, Hukou and Non-Hukou population on employment in different sectors:

$$ln(\frac{SE_{i,t}}{SE_{i,t-}}) = \delta_0 + \delta_1 \overbrace{ln(HkP_{i,t}) \quad ln(NoHkP_{i,t})}^{lnP_{i,t}} + \delta_2 lnSE_{i,t-} + \boldsymbol{\delta_3 z_{i,t-}} + \epsilon_{i,e}$$

$$ln(\frac{TE_{i,t}}{TE_{i,t-}}) = \lambda_0 + \lambda_1 \overbrace{ln(HkP_{i,t}) \quad ln(NoHkP_{i,t})}^{lnP_{i,t}} + \lambda_2 lnSE_{i,t-} + \lambda_3 lnTE_{i,t-} + \boldsymbol{\lambda_4 z_{i,t-}} + \epsilon_{i,e}$$

- HkP: Hukou population; $NoHkP$: Non-Hukou population (migrants from outside cities/regions).

$x_{i,t-}$: natural amenities (McGranahan, 1999), urban amenities (Shi et al., 2021)

$z_{i,t-}$: natural amenities, urban amenity, university, foreign direct investment (FDI) and fixed asset investment.

urban amenities index (Shi et al., 2021)
- The number of theatres per 1000 people; books per 1000 people; doctors per 1000 people; hotels per 1000 people; Bus per 1000 people

Definition and variables	Year	N	Mean	Std. Dev.	min	max
Population growth rate (PopCh)	2000-2010	284	.07	.14	-0.40	.91
	2010-2019	290	.02	.15	-0.46	.53
Employment growth rate (EmpCh)	2002-2010	276	.11	.21	-0.63	.87
	2020-2019	279	.14	.24	-0.77	.88
Employment growth rate in secondary industries (SecEmpCh)	2003-2010	272	.14	.35	-1.14	1.14
	2010-2019	278	.05	.45	-1.04	1.94
Employment growth rate in tertiary industries (TerEmpCh)	2003-2010	277	.14	.19	-0.60	.89
	2010-2019	282	.30	.19	-0.21	.93
Total Population (Pop)	2000	285	8.05	.73	5.07	10.33
	2010	287	8.12	.73	5.27	10.27
	2019	290	8.13	.77	5.47	10.37
Total employment (Emp)	2002	277	5.93	1.07	3.99	9.65
	2010	281	6.02	1.15	3.93	9.65
	2019	286	6.12	1.18	3.52	9.72
Employment in secondary industries (SecEmp)	2003	273	4.91	1.17	1.78	8.38
	2010	281	5.05	1.28	1.69	8.47
	2019	285	5.04	1.36	0.48	8.54
Employment in tertiary industries (TerEmp)	2003	277	5.15	.94	3.04	8.47
	2010	282	5.31	1.02	3.00	8.95
	2019	288	5.56	1.07	3.38	9.27
Hukou population (total population – Non-hukou population) (HkPop)	2000	289	14.88	.76	11.84	17.20
	2010	289	14.89	.74	11.97	17.08
Non-hukou population (NonhkPop)	2000	289	4.73	1.12	2.24	8.67
	2010	289	5.43	1.19	2.91	9.31
Composite index of urban amenity level (PubSev)	2002	264	1.29	.67	-0.10	3.10
	2010	272	1.43	.58	-0.53	2.94
University student per 1000 residents (University)	2002	269	1.30	1.23	-2.33	4.18
	2010	272	2.37	1.07	-0.51	4.93
Percentage of road coverage in urbanized area (RoadDensity)	2002	269	2.14	.69	0.00	4.13
	2010	278	2.53	.62	-0.17	4.21
Foreign direction investment (FDI)	2002	263	3.70	1.99	-2.30	8.54
	2010	271	5.16	1.74	-0.80	9.32
Fixed asset investment (FAI)	2002	269	13.45	.93	11.15	16.90
	2010	279	15.71	.81	13.89	18.05
Greenspace coverage in city proper (GreenRatio)	2002	269	3.27	.56	-1.71	4.09
	2010	279	3.60	.40	-0.51	4.26
Whether a prefectural city-region has coastal line (Yes=1, No=0) (CoastCity)		290	.18	.39	0.00	1.00
Average humidity level in July (Humidity)		289	4.30	.14	3.44	4.52
Gap of average temperature between January and July (TempGap)		289	3.18	.32	1.99	3.81

Note: (1) All continuous variables are in logarithms. (2) We fill in the missing data in 2002 using data from the nearest years. These include using population in 2000, secondary and tertiary employment in 2003, and Hukou and Non-hukou population in 2000.

Levels and changes of population and employment

Two tentative conclusions:

- people followed jobs to migrate to the coastal regions during 2002 to 2010

- a country-wide polycentric configuration gradually emerged based on both population and employment distributions during 2010-2019, suggesting the simultaneity between population and employment.
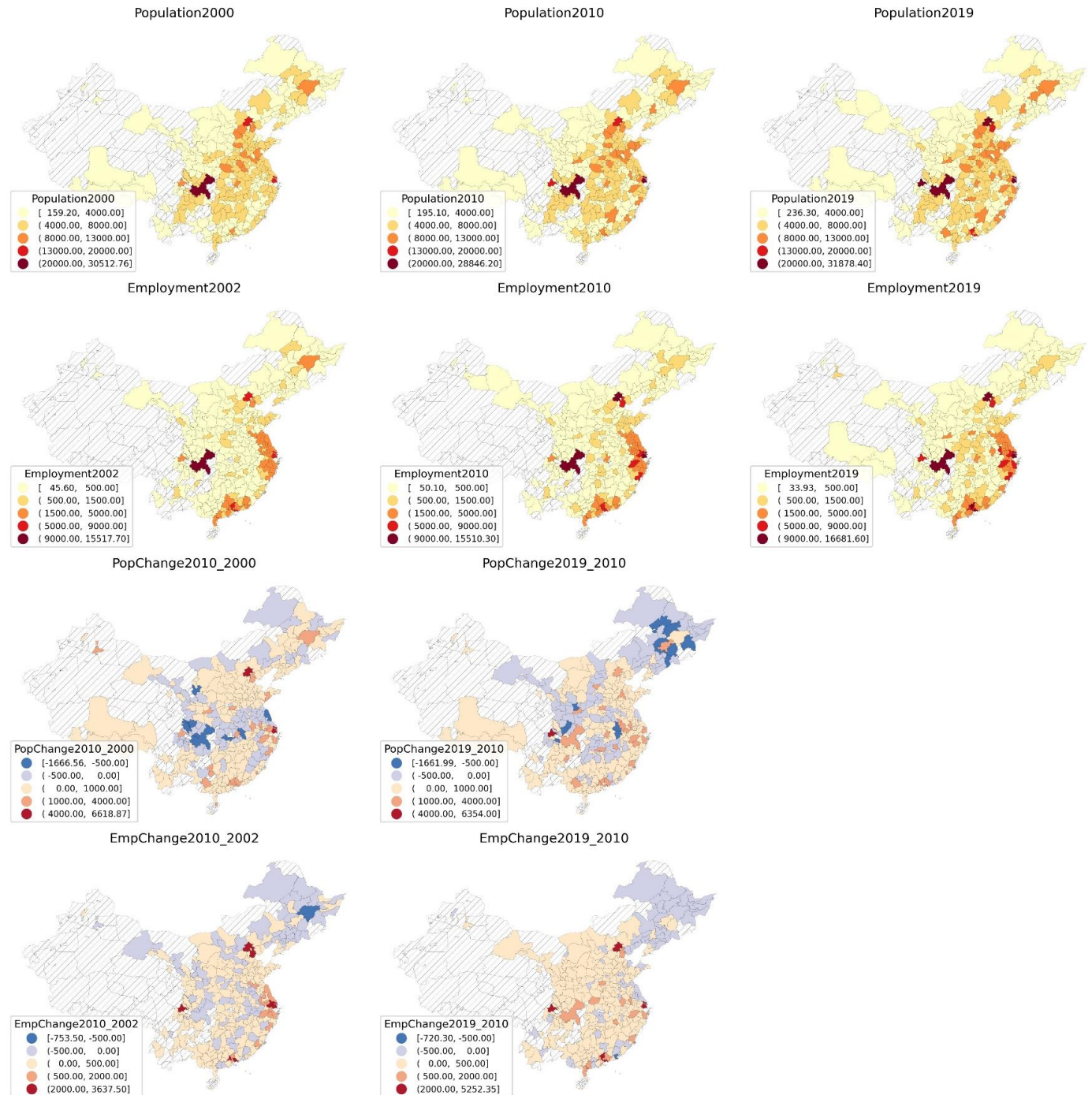
Levels and changes of employment in the secondary and tertiary sectors

- People followed jobs in both secondary and tertiary industries during 2002-2010.

- Jobs followed people (2002-2010)?
  - Employment in coastal regions grew faster;
  - population and employment changed in the opposite direction in some places.

- Jobs in both industries followed population during period two (2010-2019).
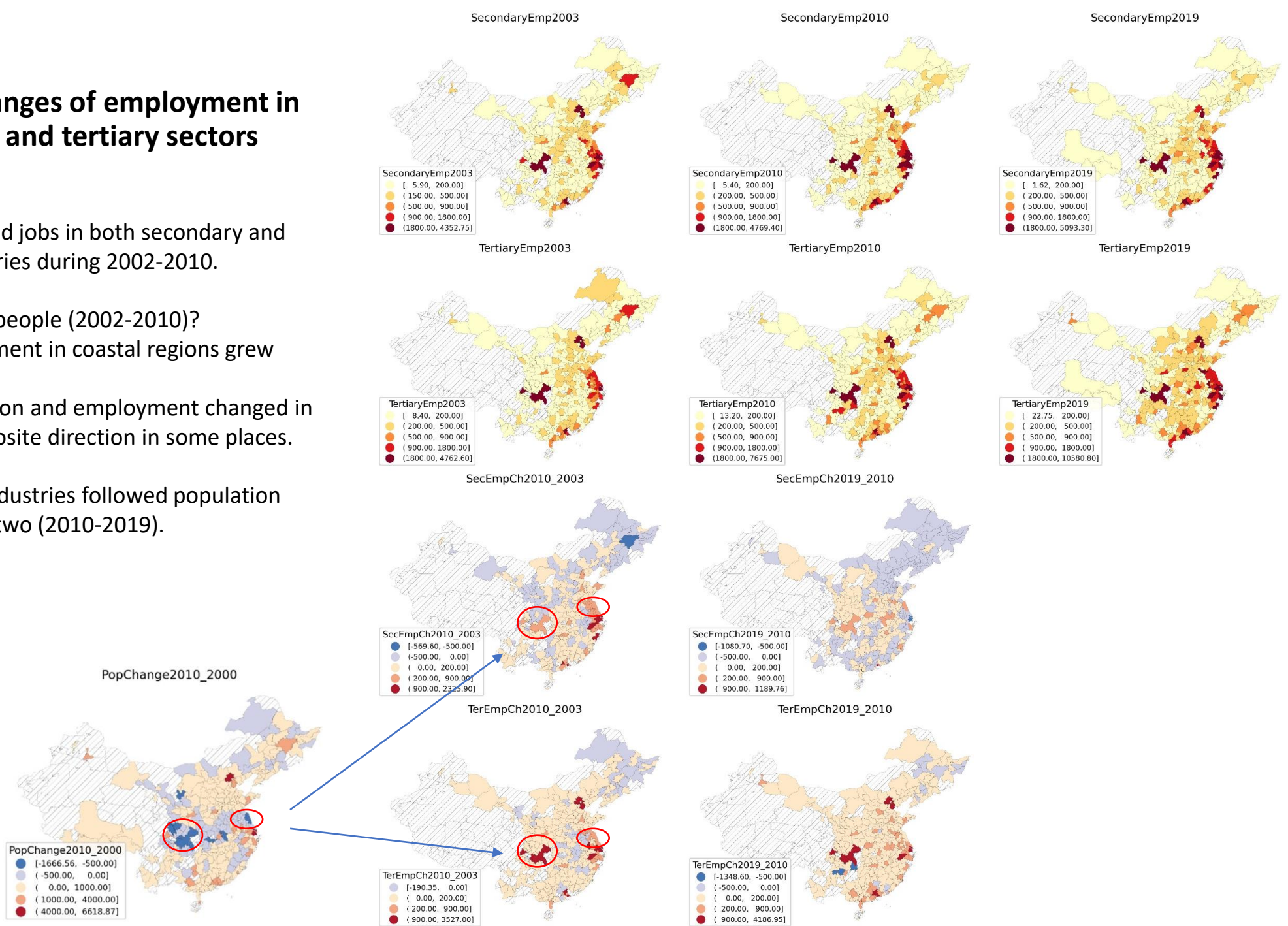
Levels and changes of Hukou and Non-Hukou population during 2000-2010

- Employment distributions display evident colocation patterns with the non-hukou population, instead of the Hukou population.

People follow jobs (in secondary and tertiary industries)?

Table 2: regressions testing the hypothesis of people following jobs (2SLS estimator)

	Period 1: 2002-2010				Period 2: 2010-2019			
	(1) ΔPop-Emp	(2) ΔPop-Emp	(3) ΔPop-SecEmp	(4) ΔPop-TerPop	(5) ΔPop-Emp	(6) ΔPop-Emp	(7) ΔPop-SecEmp	(8) ΔPop-TerPop
Emp at t (ln)	.0744***	.0328***			.0766***	.0228**		
	(.0083)	(.0099)			(.0094)	(.0099)		
SecEmp at t (ln)			.0353***				.033***	
			(.0089)				(.0082)	
TerEmp at t (ln)				.0625***				.0339**
				(.0134)				(.0128)
Pop at t- (ln)	-.0927***	-.0341**	-.0374**	-.0722***	-.0368**	.0119	-.0042	.0002
	(.0166)	(.0143)	(.0146)	(.0208)	(.0175)	(.0182)	(.0182)	(.0197)
Humidity (ln)		-.1814**	-.1637**	-.1517**		-.2888***	-.2793***	-.2748***
		(.0772)	(.0749)	(.0739)		(.073)	(.0701)	(.073)
TempGap (ln)		-.1026***	-.1017***	-.0916***		-.2051***	-.2071***	-.2001***
		(.0275)	(.0286)	(.0256)		(.0234)	(.0224)	(.0241)
PubSev (ln)		.0724***	.0691***	.0563***		.0624***	.0564***	.0581***
		(.0189)	(.0186)	(.0173)		(.0163)	(.0154)	(.0163)
GreenRatio (ln)		.0168	.0106	.0153		.0197*	.0139	.021**
		(.0102)	(.0089)	(.0097)		(.0103)	(.0095)	(.0105)
CoastCity		.0393**	.0312*	.0286		.0413**	.0319*	.0396**
		(.018)	(.0183)	(.0178)		(.0168)	(.0165)	(.0165)
BigCity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
constant	.3683***	1.095***	1.0857***	1.1333***	-.1548	1.4981***	1.5995***	1.4765***
	(.1176)	(.3424)	(.3252)	(.3214)	(.1126)	(.3224)	(.306)	(.3235)
Observations	274	262	258	259	279	268	265	269
R-squared	.305	.4492	.4516	.4654	.3188	.5434	.5736	.5453

*** $p<.01$, ** $p<.05$, * $p<.1$. Robust standard errors are in parentheses

People follow jobs (in secondary and tertiary industries)?

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Pop at t- (ln)	-.0927***	-.0341**	-.0374**	-.0722***	-.0368**	.0119	-.0042	.0002
	(.0166)	(.0143)	(.0146)	(.0208)	(.0175)	(.0182)	(.0182)	(.0197)
Humidity (ln)		-.1814**	-.1637**	-.1517**		-.2888***	-.2793***	-.2748***
		(.0772)	(.0749)	(.0739)		(.073)	(.0701)	(.073)
TempGap (ln)		-.1026***	-.1017***	-.0916***		-.2051***	-.2071***	-.2001***
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PubSev (ln)		.0724***	.0691***	.0563***		.0624***	.0564***	.0581***
		(.0189)	(.0186)	(.0173)		(.0163)	(.0154)	(.0163)
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		(.018)	(.0183)	(.0178)		(.0168)	(.0165)	(.0165)
BigCity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
constant	.3683***	1.095***	1.0857***	1.1333***	-.1548	1.4981***	1.5995***	1.4765***
	(.1176)	(.3424)	(.3252)	(.3214)	(.1126)	(.3224)	(.306)	(.3235)
Observations	274	262	258	259	279	268	265	269
R-squared	.305	.4492	.4516	.4654	.3188	.5434	.5736	.5453

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People follow jobs (in secondary and tertiary industries)?

Table 2: regressions testing the hypothesis of people following jobs (2SLS estimator)

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	(.0083)	(.0099)			(.0094)	(.0099)		
SecEmp at t (ln)			.0353***				.033***	
			(.0089)				(.0082)	
TerEmp at t (ln)				.0625***				.0339**
				(.0134)				(.0128)
Pop at t- (ln)	-.0927***	-.0341**	-.0374**	-.0722***	-.0368**	.0119	-.0042	.0002
	(.0166)	(.0143)	(.0146)	(.0208)	(.0175)	(.0182)	(.0182)	(.0197)
Humidity (ln)		-.1814**	-.1637**	-.1517**		-.2888***	-.2793***	-.2748***
		(.0772)	(.0749)	(.0739)		(.073)	(.0701)	(.073)
TempGap (ln)		-.1026***	-.1017***	-.0916***		-.2051***	-.2071***	-.2001***
		(.0275)	(.0286)	(.0256)		(.0234)	(.0224)	(.0241)
PubSev (ln)		.0724***	.0691***	.0563***		.0624***	.0564***	.0581***
		(.0189)	(.0186)	(.0173)		(.0163)	(.0154)	(.0163)
GreenRatio (ln)		.0168	.0106	.0153		.0197*	.0139	.021**
		(.0102)	(.0089)	(.0097)		(.0103)	(.0095)	(.0105)
CoastCity		.0393**	.0312*	.0286		.0413**	.0319*	.0396**
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BigCity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
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*** $p<.01$, ** $p<.05$, * $p<.1$. Robust standard errors are in parentheses

Jobs follow people?

Table 3: regressions testing the hypothesis of jobs following people (2SLS estimator)

	Period 1: 2002-2010				Period 2: 2010-2019			
	(1) ΔEmp-Pop	(2) ΔEmp-Pop	(3) ΔSecEmp-Pop	(4) ΔTertEmp-Pop	(5) ΔEmp-Pop	(6) ΔEmp-Pop	(7) ΔSecEmp-Pop	(8) ΔTertEmp-Pop
Pop at t (ln)	.0232	-.0346	-.048	-.0173	.163***	.1007**	.1377*	.0676**
	(.0269)	(.0385)	(.0647)	(.0421)	(.0288)	(.0421)	(.0827)	(.0312)
Emp at t- (ln)	.0428***	-.0383**			-.0878***	-.117***		
	(.016)	(.0167)			(.0135)	(.0157)		
SecEmp at t- (ln)			-.0592*	.0583**			-.1943***	.0244
			(.031)	(.0207)			(.0367)	(.017)
TerEmp at t- (ln)				-.0165				-.0998***
				(.0374)				(.0282)
Humidity(ln)		.0484	.0334	-.2147		-.4238***	-.4611*	-.4526***
		(.137)	(.2003)	(.1066)		(.1406)	(.2373)	(.1249)
TempGap(ln)		-.2283***	-.3698*	-.1208***		-.3205***	-.1501	-.3481***
		(.0472)	(.1959)	(.0396)		(.0499)	(.1668)	(.0726)
PubSev(ln)		.0048	-.0842	.0512*		-.032	-.13	.0085
		(.029)	(.0523)	(.0267)		(.0332)	(.0833)	(.0321)
University(ln)		-.0081	-.0025	-.0036		.0241	-.0175	.0256*
		(.0137)	(.0215)	(.01320)		(.0178)	(.0399)	(.0151)
RoadDensity(ln)		.0003	.0624*	.0186		.0746***	.1123***	.0109
		(.0209)	(.0347)	(.0129)		(.0186)	(.038)	(.0145)
FDI(ln)		.0195**	.0522***	.0158**		.0028	.0178	.0159
		(.0098)	(.0164)	(.0079)		(.0139)	(.0328)	(.0097)
FAI(ln)		.1284***	.1459***			.0843**	.2238***	
		(.0279)	(.048)			(.0389)	(.0782)	
BigCity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
constant	-.3339*	-.6604	-.1288	1.1651*	-.6657***	1.3257*	-1.3475	3.1424***
	(.1776)	(.7184)	(1.0712)	(.5855)	(.1878)	(.75)	(1.5741)	(.7349)
Observations	274	248	244	245	279	255	254	251
R-squared	.0809	.348	.3017	.4032	.1906	.4314	.3455	.379

*** p<.01, ** p<.05, * p<.1. Robust standard errors are in parentheses.
Note: FAI(ln) in models (4) and (8) are removed due to multi-collinearity

Jobs follow people?

Table 3: regressions testing the hypothesis of jobs following people (2SLS estimator)

	Period 1: 2002-2010				Period 2: 2010-2019			
	(1) ΔEmp-Pop	(2) ΔEmp-Pop	(3) ΔSecEmp-Pop	(4) ΔTertEmp-Pop	(5) ΔEmp-Pop	(6) ΔEmp-Pop	(7) ΔSecEmp-Pop	(8) ΔTertEmp-Pop
Pop at t (ln)	.0232	-.0346	-.048	-.0173	.163***	.1007**	.1377*	.0676**
	(.0269)	(.0385)	(.0647)	(.0421)	(.0288)	(.0421)	(.0827)	(.0312)
Emp at t- (ln)	.0428***	-.0383**			-.0878***	-.117***		
	(.016)	(.0167)			(.0135)	(.0157)		
SecEmp at t- (ln)			-.0592*	.0583**			-.1943***	.0244
			(.031)	(.0207)			(.0367)	(.017)
TerEmp at t- (ln)				-.0165				-.0998***
				(.0374)				(.0282)
Humidity(ln)		.0484	.0334	-.2147		-.4238***	-.4611*	-.4526***
		(.137)	(.2003)	(.1066)		(.1406)	(.2373)	(.1249)
TempGap(ln)		-.2283***	-.3698*	-.1208***		-.3205***	-.1501	-.3481***
		(.0472)	(.1959)	(.0396)		(.0499)	(.1668)	(.0726)
PubSev(ln)		.0048	-.0842	.0512*		-.032	-.13	.0085
		(.029)	(.0523)	(.0267)		(.0332)	(.0833)	(.0321)
University(ln)		-.0081	-.0025	-.0036		.0241	-.0175	.0256*
		(.0137)	(.0215)	(.01320)		(.0178)	(.0399)	(.0151)
RoadDensity(ln)		.0003	.0624*	.0186		.0746***	.1123***	.0109
		(.0209)	(.0347)	(.0129)		(.0186)	(.038)	(.0145)
FDI(ln)		.0195**	.0522***	.0158**		.0028	.0178	.0159
		(.0098)	(.0164)	(.0079)		(.0139)	(.0328)	(.0097)
FAI(ln)		.1284***	.1459***			.0843**	.2238***	
		(.0279)	(.048)			(.0389)	(.0782)	
BigCity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
constant	-.3339*	-.6604	-.1288	1.1651*	-.6657***	1.3257*	-1.3475	3.1424***
	(.1776)	(.7184)	(1.0712)	(.5855)	(.1878)	(.75)	(1.5741)	(.7349)
Observations	274	248	244	245	279	255	254	251
R-squared	.0809	.348	.3017	.4032	.1906	.4314	.3455	.379

*** p<.01, ** p<.05, * p<.1. Robust standard errors are in parentheses.
Note: FAI(ln) in models (4) and (8) are removed due to multi-collinearity

Jobs follow people?

Table 3: regressions testing the hypothesis of jobs following people (2SLS estimator)

	Period 1: 2002-2010				Period 2: 2010-2019			
	(1) ΔEmp -Pop	(2) ΔEmp -Pop	(3) ΔSecEmp -Pop	(4) ΔTertEmp -Pop	(5) ΔEmp -Pop	(6) ΔEmp -Pop	(7) ΔSecEmp -Pop	(8) ΔTertEmp -Pop
Pop at t (ln)	.0232	-.0346	-.048	-.0173	.163***	.1007**	.1377*	.0676**
	(.0269)	(.0385)	(.0647)	(.0421)	(.0288)	(.0421)	(.0827)	(.0312)
Emp at t- (ln)	.0428***	-.0383**			-.0878***	-.117***		
	(.016)	(.0167)			(.0135)	(.0157)		
SecEmp at t- (ln)			-.0592*	.0583**			-.1943***	.0244
			(.031)	(.0207)			(.0367)	(.017)
TerEmp at t- (ln)				-.0165				-.0998***
				(.0374)				(.0282)
Humidity(ln)		.0484	.0334	-.2147		-.4238***	-.4611*	-.4526***
		(.137)	(.2003)	(.1066)		(.1406)	(.2373)	(.1249)
TempGap(ln)		-.2283***	-.3698*	-.1208***		-.3205***	-.1501	-.3481***
		(.0472)	(.1959)	(.0396)		(.0499)	(.1668)	(.0726)
PubSev(ln)		.0048	-.0842	.0512*		-.032	-.13	.0085
		(.029)	(.0523)	(.0267)		(.0332)	(.0833)	(.0321)
University(ln)		-.0081	-.0025	-.0036		.0241	-.0175	.0256*
		(.0137)	(.0215)	(.01320)		(.0178)	(.0399)	(.0151)
RoadDensity(ln)		.0003	.0624*	.0186		.0746***	.1123***	.0109
		(.0209)	(.0347)	(.0129)		(.0186)	(.038)	(.0145)
FDI(ln)		.0195**	.0522***	.0158**		.0028	.0178	.0159
		(.0098)	(.0164)	(.0079)		(.0139)	(.0328)	(.0097)
FAI(ln)		.1284***	.1459***			.0843**	.2238***	
		(.0279)	(.048)			(.0389)	(.0782)	
BigCity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
constant	-.3339*	-.6604	-.1288	1.1651*	-.6657***	1.3257*	-1.3475	3.1424***
	(.1776)	(.7184)	(1.0712)	(.5855)	(.1878)	(.75)	(1.5741)	(.7349)
Observations	274	248	244	245	279	255	254	251
R-squared	.0809	.348	.3017	.4032	.1906	.4314	.3455	.379

*** p<.01, ** p<.05, * p<.1. Robust standard errors are in parentheses.
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	(.0269)	(.0385)	(.0647)	(.0421)	(.0288)	(.0421)	(.0827)	(.0312)
Emp at t- (ln)	.0428***	-.0383**			-.0878***	-.117***		
	(.016)	(.0167)			(.0135)	(.0157)		
SecEmp at t- (ln)			-.0592*	.0583**			-.1943***	.0244
			(.031)	(.0207)			(.0367)	(.017)
TerEmp at t- (ln)				-.0165				-.0998***
				(.0374)				(.0282)
Humidity(ln)		.0484	.0334	-.2147		-.4238***	-.4611*	-.4526***
		(.137)	(.2003)	(.1066)		(.1406)	(.2373)	(.1249)
TempGap(ln)		-.2283***	-.3698*	-.1208***		-.3205***	-.1501	-.3481***
		(.0472)	(.1959)	(.0396)		(.0499)	(.1668)	(.0726)
PubSev(ln)		.0048	-.0842	.0512*		-.032	-.13	.0085
		(.029)	(.0523)	(.0267)		(.0332)	(.0833)	(.0321)
University(ln)		-.0081	-.0025	-.0036		.0241	-.0175	.0256*
		(.0137)	(.0215)	(.01320)		(.0178)	(.0399)	(.0151)
RoadDensity(ln)		.0003	.0624*	.0186		.0746***	.1123***	.0109
		(.0209)	(.0347)	(.0129)		(.0186)	(.038)	(.0145)
FDI(ln)		.0195**	.0522***	.0158**		.0028	.0178	.0159
		(.0098)	(.0164)	(.0079)		(.0139)	(.0328)	(.0097)
FAI(ln)		.1284***	.1459***			.0843**	.2238***	
		(.0279)	(.048)			(.0389)	(.0782)	
BigCity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
constant	-.3339*	-.6604	-.1288	1.1651*	-.6657***	1.3257*	-1.3475	3.1424***
	(.1776)	(.7184)	(1.0712)	(.5855)	(.1878)	(.75)	(1.5741)	(.7349)
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*** p<.01, ** p<.05, * p<.1. Robust standard errors are in parentheses.
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Do Jobs follow Hukou or Non-Hukou population?

Table 4: regressions testing the varying effects of the Hukou and Non-hukou population on secondary and tertiary employment (reduced-form solution)

	Period 1: 2002-2010					
	(1) ΔSecEmp-HkPop	(2) ΔSecEmp-Nhk-Pop	(3) ΔSecEmp-Hk+Nhk	(4) ΔThirdEmp-HkPop	(5) ΔThirdEmp-NhkPop	(6) ΔThirdEmp-Hk+Nhk
HkPop at t- (ln)	-.0014 (.0464)		-.0082 (.0473)	-.0231 (.0303)		-.0227 (.0294)
NoHkPop at t- (ln)		-.0337 (.0414)	-.0347 (.0425)		.0334* (.0197)	.0336* (.0197)
SecEmp at t- (ln)	-.0626** (.0311)	-.0506 (.0354)	-.0502 (.0359)	.0556*** (.0214)	.049** (.0225)	.0443* (.0234)
TerEmp at t- (ln)				.0044 (.0338)	-.0173 (.0253)	-.0039 (.0307)
Observations	244	244	244	245	245	245
R-squared	.3014	.3035	.3035	.4074	.4095	.411

	Period 2: 2010-2019					
	(7) ΔSecEmp-HkPop	(8) ΔSecEmp-Nhk-Pop	(9) ΔSecEmp-Hk+Nhk	(10) ΔThirdEmp-HkPop	(11) ΔThirdEmp-NhkPop	(12) ΔThirdEmp-Hk+Nhk
HkPop at t- (ln)	.0361 (.0811)		.0389 (.0803)	-.0088 (.0285)		-.0186 (.0275)
NoHkPop at t- (ln)		.0795* (.0431)	.0801* (.0431)		.0566*** (.0207)	.0581*** (.0205)
SecEmp at t- (ln)	-.118*** (.0337)	-.1479*** (.0361)	-.1528*** (.0376)	.018 (.0168)	.006 (.0191)	.0035 (.0185)
TerEmp at t- (ln)				-.0623** (.0273)	-.0877*** (.025)	-.0785*** (.0272)
Observations	254	254	254	257	257	257
R-squared	.3168	.3136	.317	.3572	.3779	.379

*** $p<.01$, ** $p<.05$, * $p<.1$; Robust standard errors are in parentheses

Notes: (1) all models use reduced form solutions due to the lack of Hukou and non-Hukou population in 2020; (2) all models include the controls of urban and natural amenities, FDI, FAI, and a big city dummy variable

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HkPop at t- (ln)	-.0014 (.0464)		-.0082 (.0473)	-.0231 (.0303)		-.0227 (.0294)
NoHkPop at t- (ln)		-.0337 (.0414)	-.0347 (.0425)		.0334* (.0197)	.0336* (.0197)
SecEmp at t- (ln)	-.0626** (.0311)	-.0506 (.0354)	-.0502 (.0359)	.0556*** (.0214)	.049** (.0225)	.0443* (.0234)
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	(7) ΔSecEmp-HkPop	(8) ΔSecEmp-Nhk-Pop	(9) ΔSecEmp-Hk+Nhk	(10) ΔThirdEmp-HkPop	(11) ΔThirdEmp-NhkPop	(12) ΔThirdEmp-Hk+Nhk
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	Period 2: 2010-2019					
	(7) ΔSecEmp-HkPop	(8) ΔSecEmp-Nhk-Pop	(9) ΔSecEmp-Hk+Nhk	(10) ΔThirdEmp-HkPop	(11) ΔThirdEmp-NhkPop	(12) ΔThirdEmp-Hk+Nhk
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Conclusion

- **People follow jobs:**
  - jobs and amenities are the primary concerns of individuals' migration decisions. While people have followed jobs, the influence of natural and urban amenities have gradually increased over the past two decades.
- **Jobs follow people?**
  - job distribution was independent of population distribution during 2000-2010;
  - they were simultaneously determined during 2010-2019, suggesting the increasing attraction of human capital to firms and the needs to expand local service supplies to new in-migrants.

- **Variables disaggregation:**
  - population distribution has a weaker relationship with secondary sectors than with tertiary ones
    - Locational decision-making of manufacturing industries is primarily pre-determined by natural and transport advantages to minimize production costs;
    - service industries are concerned with labor forces and local consumer demands.
  - it is the non-hukou population instead of the hukou population that fuels local employment growth of service industries, suggesting the adverse impacts of the Hukou policy on reducing social equity and economic efficiency.

Questions and Comments

Thank you!

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Jobs follow amenities

- Amenities directly affect a firms' location decision through their influence on firms' production structure (Allison, 1993).
  - Rustbelt and Sunbelt: **natural amenities**, such as mean temperature, latitude, and humidity affect manufacturing employment distribution (Carlino and Mills, 1987; Glaeser and Tobio, 2007).
  - Availability of educational options and closeness to **universities** reduce the cost of training or retaining employees.
  - Lower crime rate reduce the costs for **security** (Florida et al., 2008).
  - Producer services, Telecommunication and business services: **shopping, education, recreation, and entertainment** significantly reduce their costs in interaction and daily expenses (Markusen et al., 1986; Moeller, 2014).
  - Manufacturing industries: public facilities such as **freeway density** and transportation infrastructure.

| | Panel 1: Total Population | | | | | |
| | Period 1 | | | Period 2 | | |
	(1) ΔEmp-Pop	(2) ΔSecEmp-Pop	(3) ΔThirdEmp-Pop	(4) ΔEmp-Pop	(5) ΔSecEmp-Pop	(6) ΔThirdEmp-Pop
Population at t (ln)	-.0346 (.0385)	-.048 (.0647)	-.0791 (.0481)	.1007** (.0421)	.1568** (.0774)	.0397 (.0397)
Employment at t- (ln)	-.0383** (.0167)			-.117*** (.0157)		
SecondEmp at t- (ln)		-.0592* (.031)	.0462** (.0192)		-.1764*** (.0359)	.0234 (.0168)
ThirdEmp at t- (ln)			-.0165 (.0374)			-.0998*** (.0282)

| | Panel 2: Human Capital | | | | | |
| | Period 1 | | | Period 2 | | |
	(7) ΔEmp-HumCap	(8) ΔSecEmp-HumCap	(9) ΔThirdEmp-HumCap	(10) ΔEmp-HumCap	(11) ΔSecEmp-HumCap	(12) ΔThirdEmp-HumCap
HumanCapital at t (ln)	-.0354 (.0427)	-.1926** (.0814)	-.0435 (.0533)	.0949** (.0441)	.0653 (.0767)	.0827* (.0447)
Employment at t- (ln)	-.0411** (.0173)			-.1137*** (.0167)		
SecondEmp at t- (ln)		-.0609* (.0311)	.0528*** (.0193)		-.1574*** (.0379)	.02 (.0163)
ThirdEmp at t- (ln)			-.0353 (.0371)			-.0977*** (.0276)

Robust standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*